

A Picture Book of Astronomy

**BORIS LEVIN,
LIDIA RADLOVA**



A Picture Book

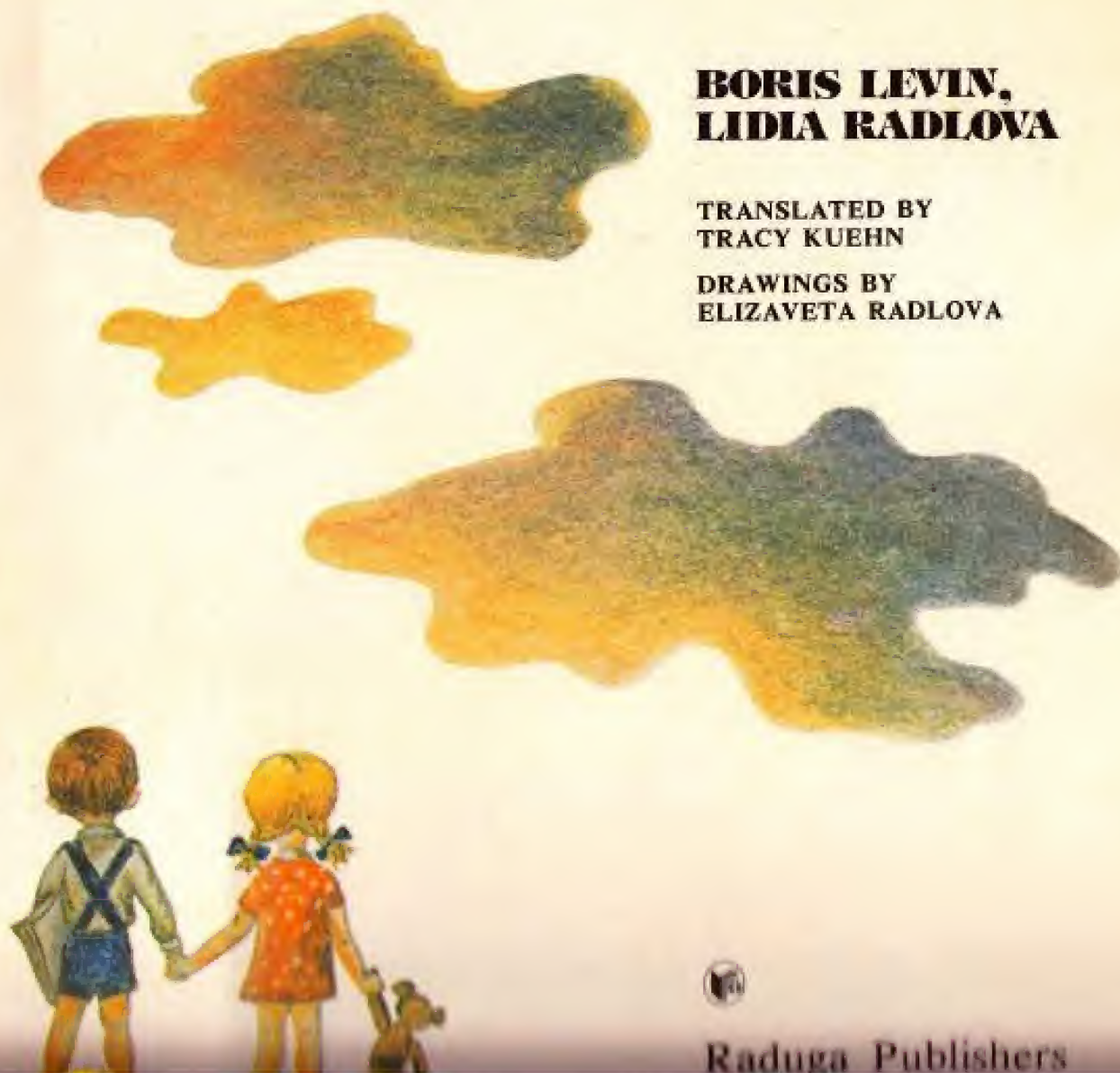


of Astronomy

**BORIS LEVIN,
LIDIA RADLOVA**

TRANSLATED BY
TRACY KUEHN

DRAWINGS BY
ELIZAVETA RADLOVA



Raduga Publishers

How Many Stars Are in the Sky?

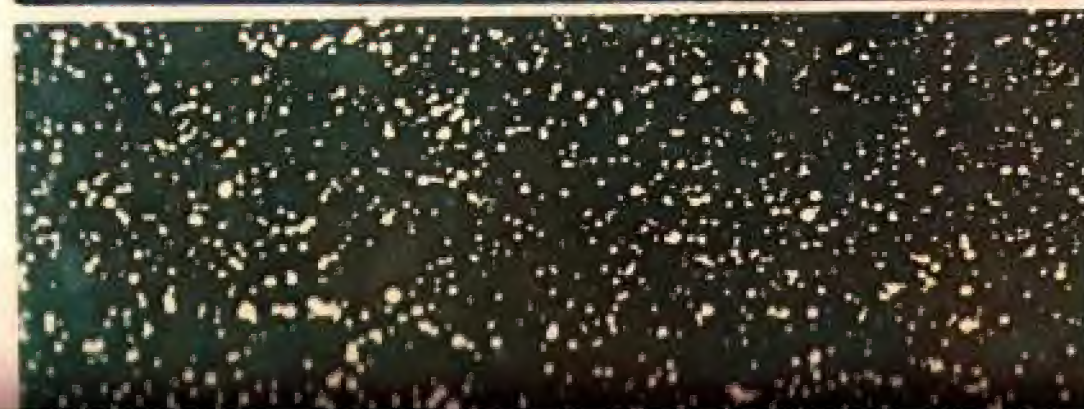


When evening falls the sky darkens and the brightest stars appear. Gradually you can see more and more stars. How many are there?

"Almost three thousand!" says a man who tried to count those stars.

"Millions!" says an astronomer who watches the starry sky through a telescope.

"Many millions!" says a scientist who studies photographs of the outer space.



What Is a Constellation?



The dark, cloudless night sky is full of stars. Stars are like bright dots.

In ancient times people looked at the sky and imagined that those dots of stars were drawings. They called those drawings constellations.

Those constellations reminded the ancient Greeks of their favorite heroes: Hercules, Perseus, Andromeda. Other constellations looked like animals and things: Draco (a dragon), Cygnus (a swan), Lyra (a lyre).

Now scientists divide the sky into sections. Those sections are called constellations.



Why Are the Dippers in the Sky Called Bears?



It is easy to find the seven brightest stars lying in the shape of a dipper. In fact, that is what it is called, the Big Dipper. Near it are also other stars, though they are not as bright.

All together they look like the head and legs of an animal with the handle of the dipper as its long tail.

That constellation is called Ursa Major, or the Great Bear, though a real bear's tail is not long, but very short.



How to Find the North Star



In the east stars rise and in the other side of the sky, the west, they sink lower and finally set. That happens because the Earth turns.

Only one star remains motionless, and the entire sky seems to move around it. That is the North Star. If we were on the North Pole, it would be right over our heads.

The North Star is part of the Little Dipper — the Ursa Minor, or Small Bear constellation. It is the brightest star in the constellation.

Where should you look for the North Star? First you need to find the Big Dipper that is the Great Bear constellation. Then move your eyes up along the line made by the stars on the side opposite the handle.



How Do We Know the Earth Is Round?



When we walk along an even field it seems to be flat.

The sea also seems flat. A long time ago that is what people thought. They thought that the Earth was flat and the sky was like a cap on top of it.

Now everyone knows that the Earth is round. But how can we test that?

When a ship goes out to sea it does not disappear all at once. First the hull sinks behind the horizon. Then the deck moves out of sight. And then the mast, which you can still see for a long time, finally disappears.

That is because the surface of the sea is curved. And it is curved because the Earth is round.



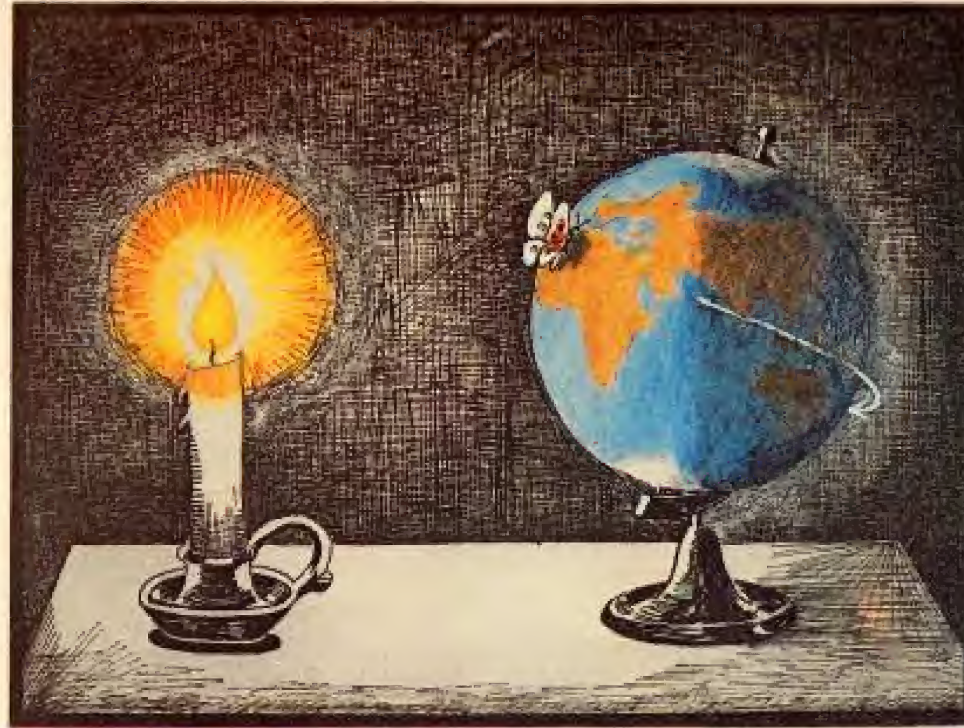
Why Is There Night and Day?



Everyone knows that it is light during the day, and dark at night.

Day occurs on that part of the Earth which is turned toward the Sun and lit by its rays. The other half of the Earth is away from the Sun at that time and is in the shadows.

The Earth turns all the time like a top, and that is why day and night change all the time.



Why Is There Summer and Winter?

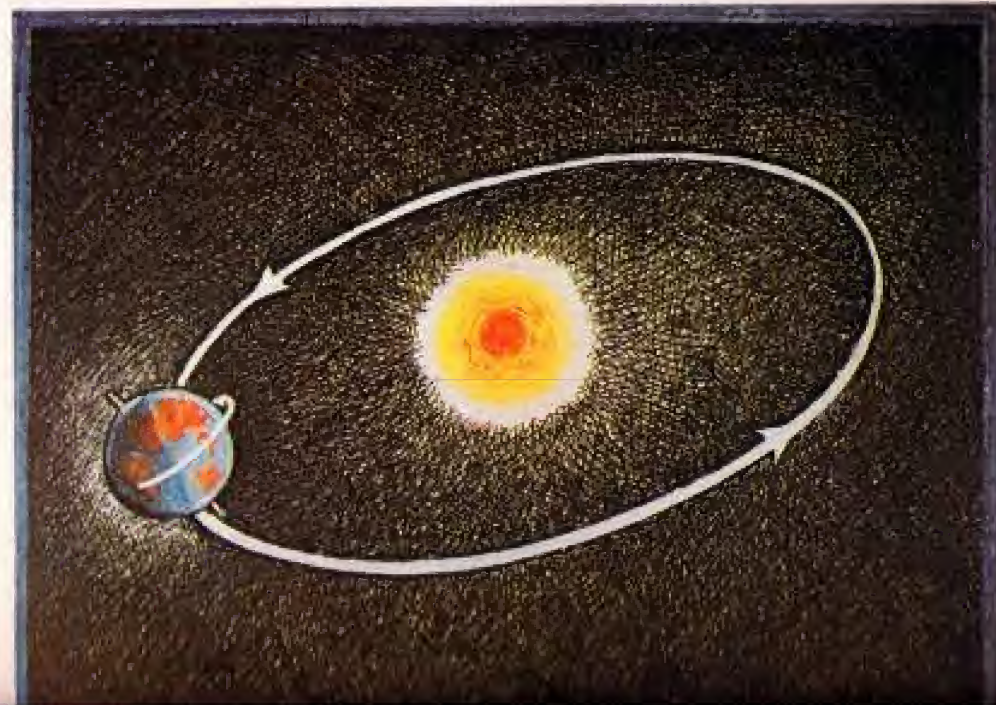
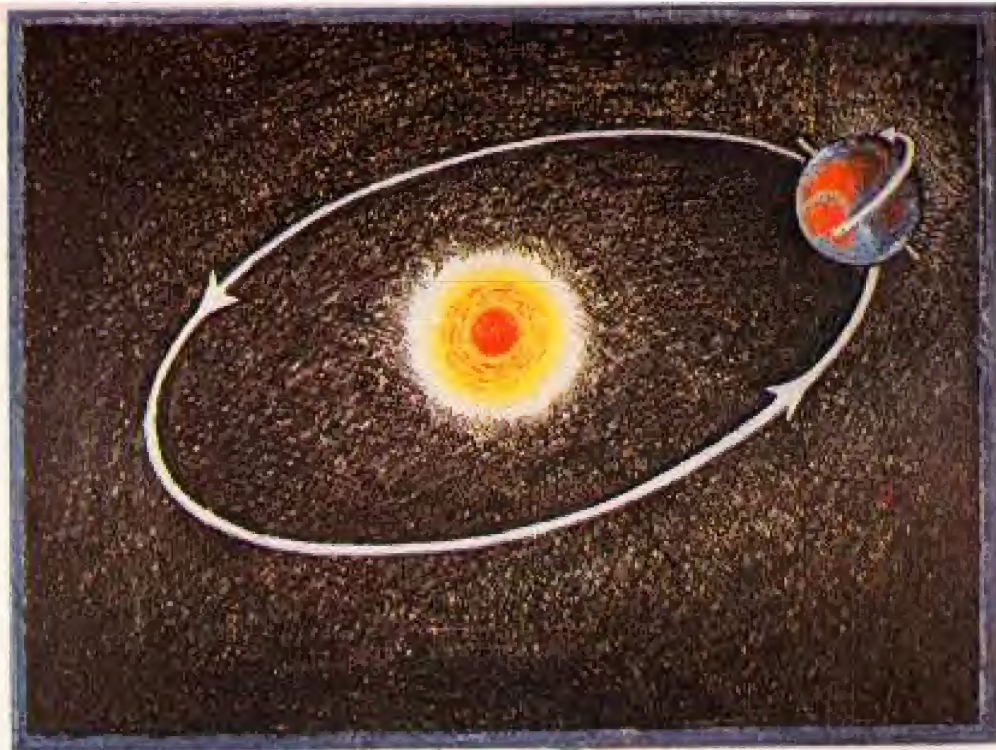


In the summer the Sun is high in the sky. The days are long and warm. But in the winter the Sun is low. The days are short and cold. Why does that happen?

The Earth is one of the Sun's satellites which means that the Earth moves around the Sun. It takes the Earth exactly one year to make this journey.

The Earth is divided into two halves, a northern half and a southern half. These are called the Northern Hemisphere and the Southern Hemisphere. When the Earth is in the position shown in the top drawing, the Northern Hemisphere receives more sunlight and it is summer for the people living there. It is winter in the Southern Hemisphere then.

Six months later the Earth has turned and the Northern Hemisphere is away from the Sun, as shown in the lower drawing. Then it receives less sun and it is winter there. But in the Southern Hemisphere it is summer.



Which Heavenly Bodies Are Called Planets?



1



2



3



At night we can often see heavenly bodies in the sky which look like stars, but shine with an even light even when the real stars are blinking. If you watch those heavenly bodies carefully for several evenings, you will notice that they slowly move among the stars. Those wandering heavenly bodies are the planets.

Find the planet in drawings 1, 2 and 3. See how its position changes.

Drawing 4 shows the planet's path among the stars.

Planets are cold heavenly bodies. They revolve around the Sun like our Earth.

The Sun shines on the planets and that is why we can see them.



What Are Our Neighbors Venus and Mars Like?



The planet Venus is brighter than all the stars. It was named after the Roman goddess of beauty. Venus can be seen in the west in the evening or in the east early in the morning (Drawing 1). If you look through a telescope it appears completely white, with no spots. But that is not the planet itself. You are seeing the thick layer of clouds which surround it. The atmosphere of Venus contains poisonous gases. People cannot breathe it.

When the Sun shines on Venus from the side, we can only see half of it (Drawing 3).

Our other neighbor, Mars, was named after the ancient Roman god of war. It looks like a red star in the sky (Drawing 2). The red color comes from the Martian deserts (Drawing 4). The deserts are crossed with lines. Earlier some scientists thought that those lines were canals and plants growing along the banks of the canals. Now we know that there are no canals on Mars. Mars does not have much atmosphere, so it is not good for breathing either.

3



Which Is Bigger, the Sun or the Moon?



In the sky the Sun and the Moon seem to be the same size.

But everything depends on how far away you are. A big plane flying far in the sky looks just as small as a little bird sitting close by.

The Sun is much farther from us than the Moon. But it is much larger than the Moon.



How Far Is It to the Moon?



If a person walked 30 kilometers a day, he would have to walk 35 years without stopping to get from the Earth to the Moon.

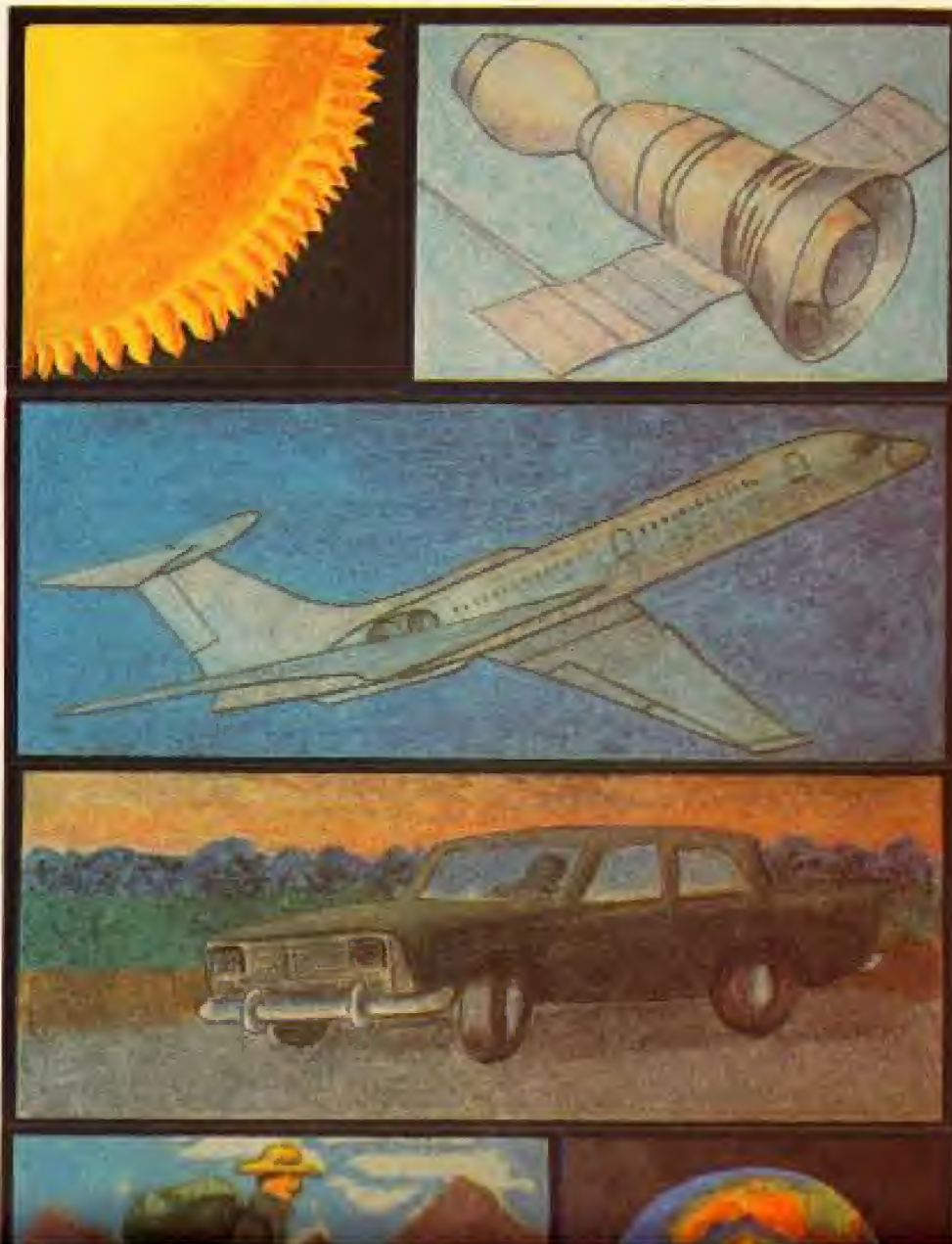
It would take a car, traveling at 80 kilometers an hour, more than six months to cover the same distance. A plane going 900 kilometers an hour could reach the Moon in about three weeks.

Man-made satellites go at speeds from 25 to 30 thousand kilometers an hour. They could make the trip in 12 to 16 hours. Rockets flying to the Moon go slower and reach it in 2 or 3 days.

How Far to the Sun?

It is 400 times farther to the Sun than to the Moon.

For a hiker to go from the Earth to the Sun, he would have to walk about 14 thousand years. A car would take 200 years. A plane, about 25 years. Even a man-made satellite would only reach the Sun in 7 or 8 months.



Why Does the Moon Change Shape?



1



2



You have probably noticed that the Moon does not always look the same. Its shape changes over the course of a month. We either see a thin sickle shape, or a half circle, or a full Moon. Sometimes we cannot see the Moon at all. Why?

The Moon itself does not shine. We can see it only because it is lit by the Sun. The Sun shines on one half of the Moon and the other half is in darkness. The Moon is the Earth's satellite. It takes one month for it to travel around the Earth.

When the Moon is in the position as shown in drawing 1, on the right, then only the edge of the bright half of the Moon is visible on Earth. We see a thin sliver (Drawing 1, on the left). Each day the sliver gets larger. The Moon seems to be growing. When the Moon is lit up from the side, we see half of the bright side (Drawing 2). As the Moon moves around the Earth it reaches the side of the Earth which is away from the Sun (Drawing 3). Then we see the entire bright side and it looks

in drawing 4. Later we see the narrow sliver again, but turned to the other side (Drawing 5).

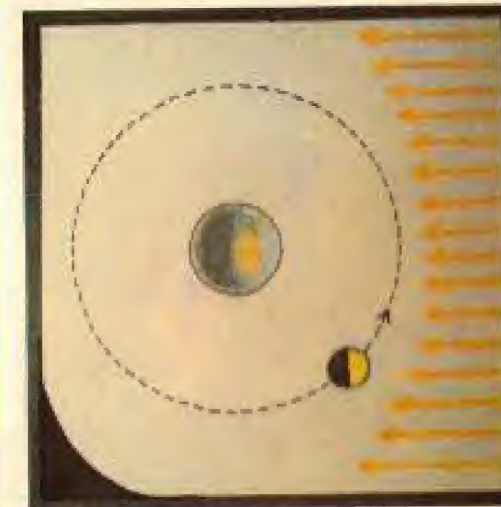
Each day the Moon gets narrower and narrower. It is disappearing.

When the Moon is between the Earth and the Sun the dark side is turned toward us and we cannot see the Moon at all (Drawing 6).

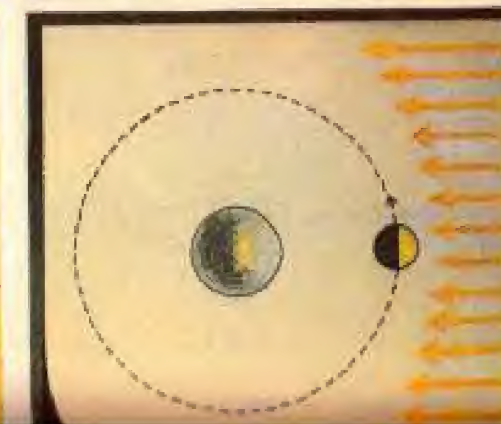
This happens each month. These changes are called lunar phases.



4



5



Why Can We See a Face on the Moon?



At full moon, when the Moon is round, you can see a face on it with two eyes, a nose and a mouth.

Through a telescope the Moon looks like the picture on the right. It has dark and light places. If you look at that photograph from far away, the dark spots begin to look like eyes, a nose and a mouth.

The dark spots on the Moon are called seas, but they are not real seas. They have no water.

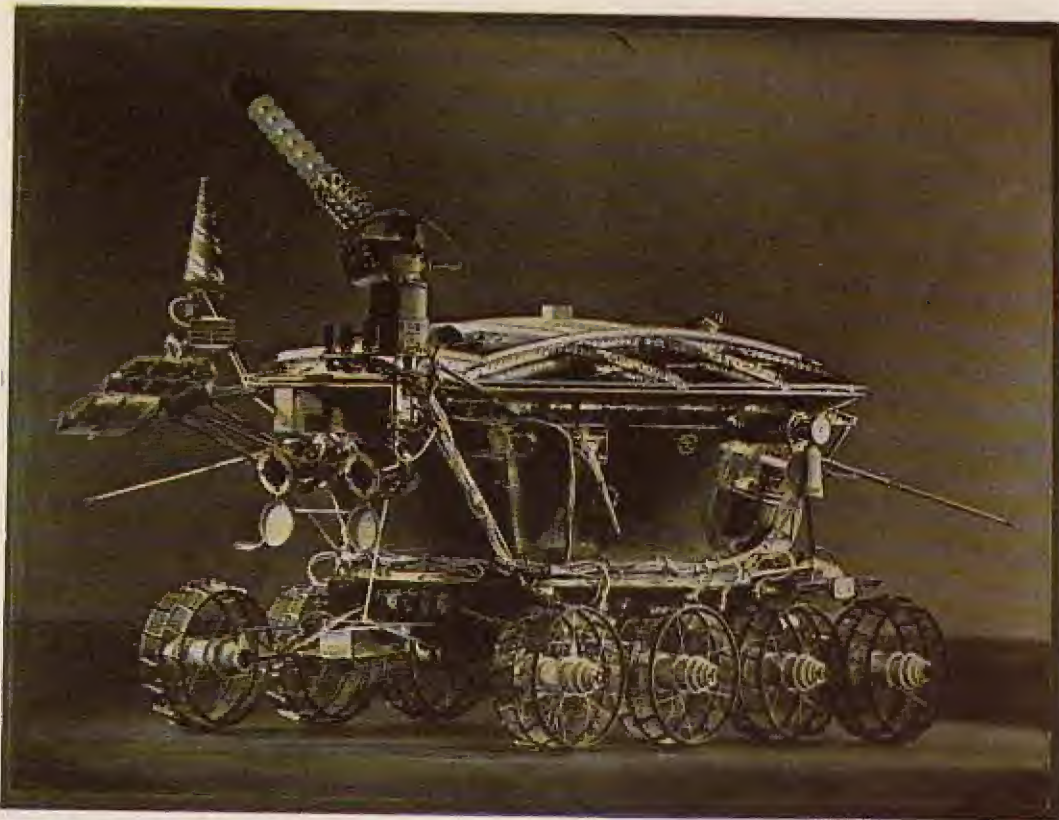


What Did the Astronauts Who Landed
on the Moon See?



The surface of the Moon looks cheerless. It is very dark and covered with large and small depressions. The Moon's mountains are high, but with gently sloping sides. There are no mountain peaks or steep cliffs. There is no water and no air on the Moon, so there is no life. The American astronauts Armstrong and Aldrin saw this in 1969 when they landed on the lunar surface. They were the first men on the Moon. Before that, in 1966, a Soviet automatic research station had landed on the Moon.

In 1970 a rocket took the Soviet self-moving research station *Lunokhod 1* to the Moon. For several months it traveled on the Moon, sending scientific observations to Earth by radio. By television it sent pictures of the area surrounding it. The tracks of the *Lunokhod's* wheels could be seen on the soft lunar soil.

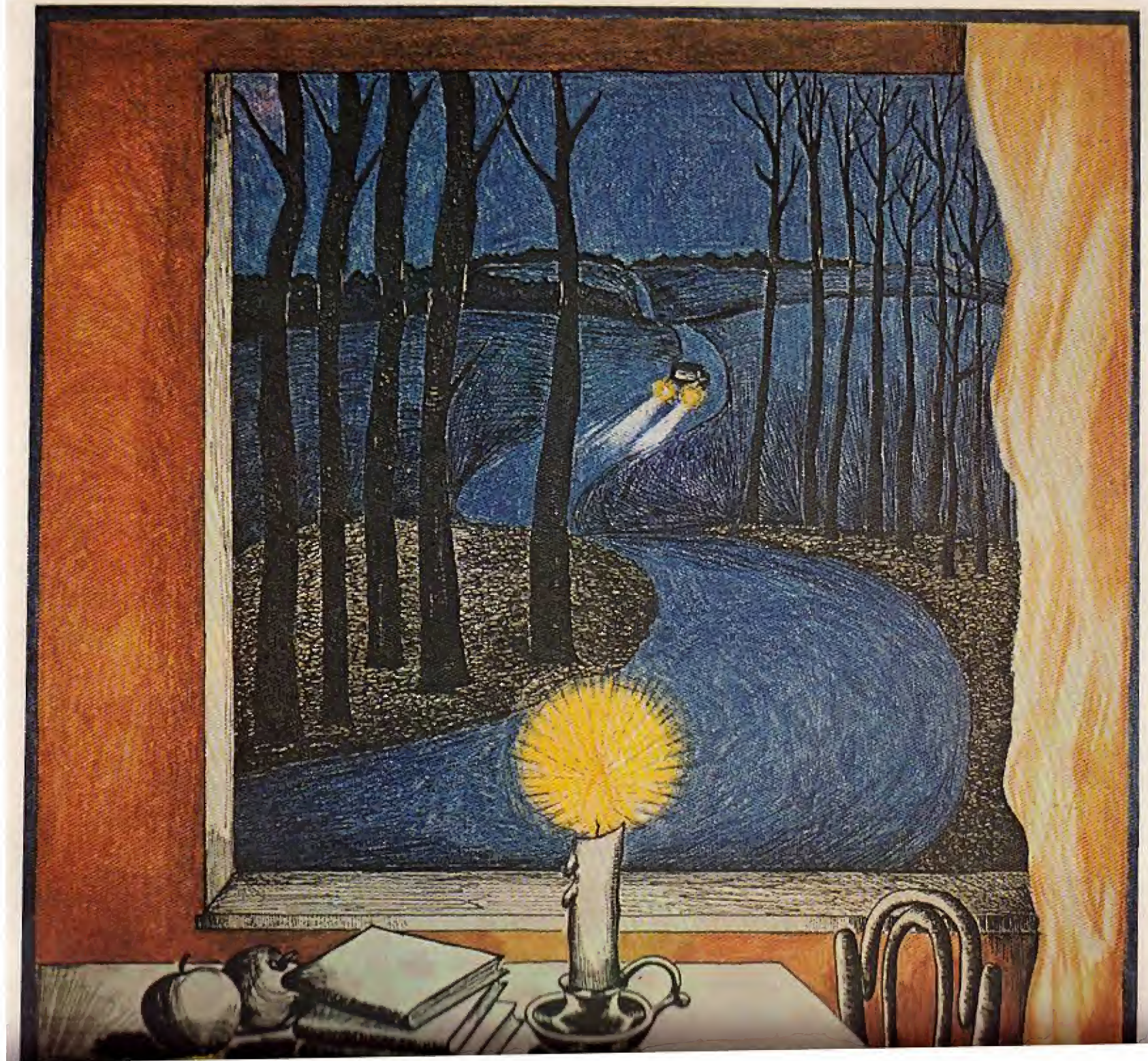


Why Is the Sun Brighter Than the Stars?



The Sun shines many million times brighter than the stars. But a candle standing next to you on the table shines brighter than the headlights of a car in the distance. Everything depends on how far away the light source is.

Both the Sun and the stars are huge burning fireballs. But the stars are millions of times farther from us than the Sun and that is why they seem to be little weak dots in the dark sky.



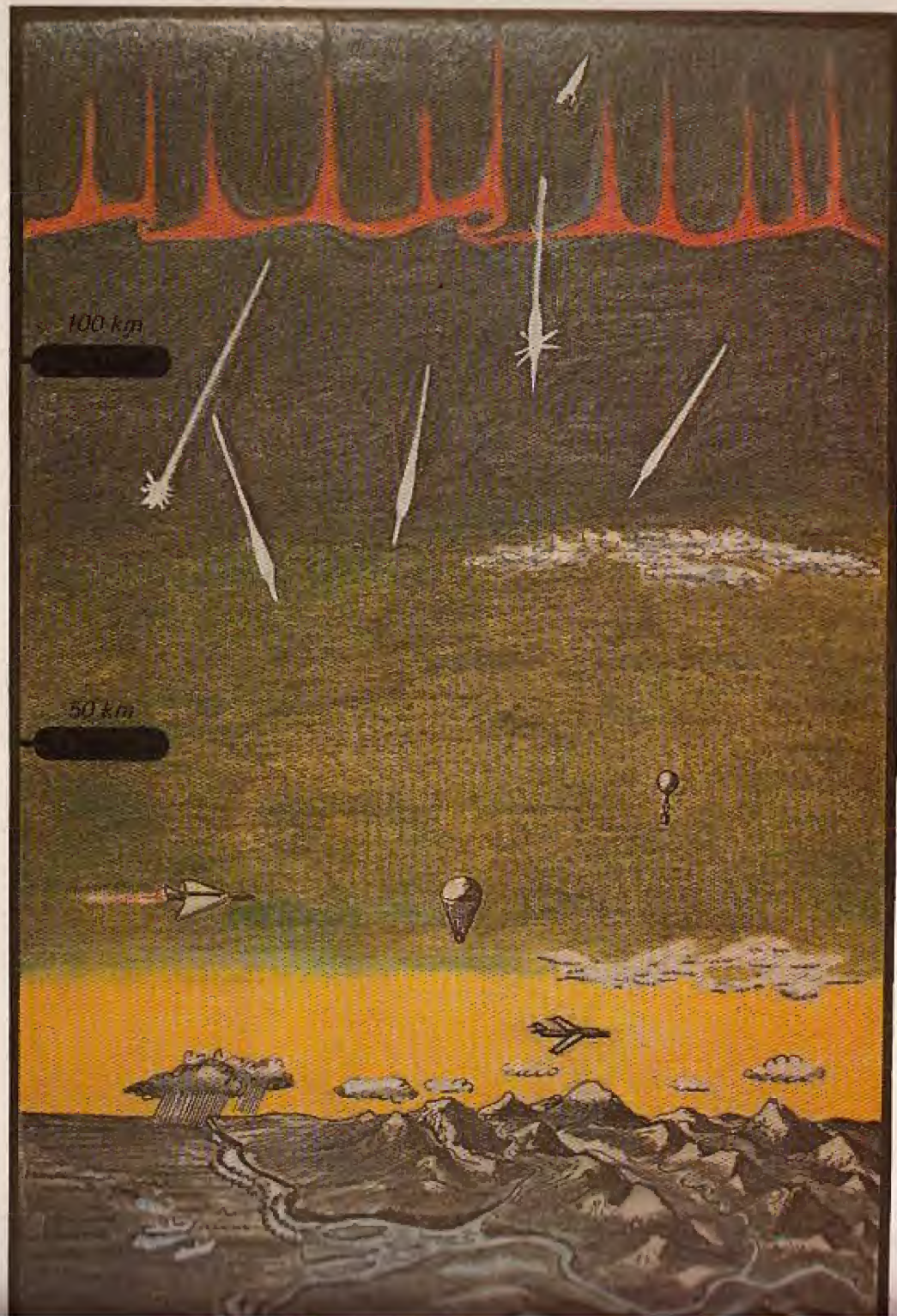
What Is a Falling Star?



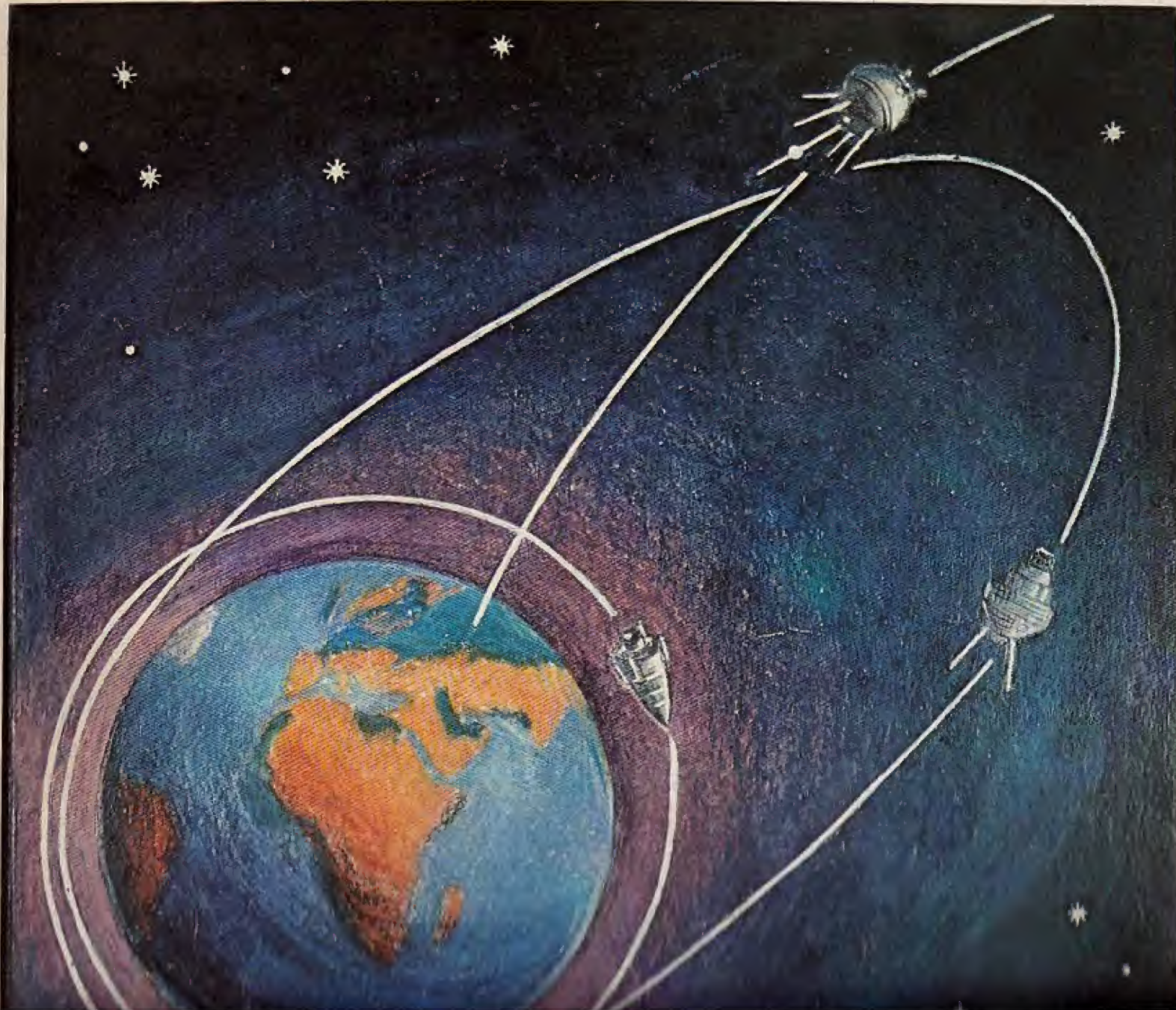
Sometimes a bright dot quickly flies across the sky. It looks like a star that has fallen. But stars never fall and have been in the same place from the beginning of time.

Falling stars are not stars at all. They are flashes high up in the Earth's atmosphere. They are caused by small grains of sand and rocks which have come from outer space. These little rocks travel at tremendous speeds and heat up on coming in contact with the Earth's atmosphere.

Falling stars flash higher than mountains and clouds. Higher than planes and stratospheric balloons fly. But they are lower than man-made satellites and the northern lights.



What Paths Do Man-Made Satellites and Space Rockets Take?

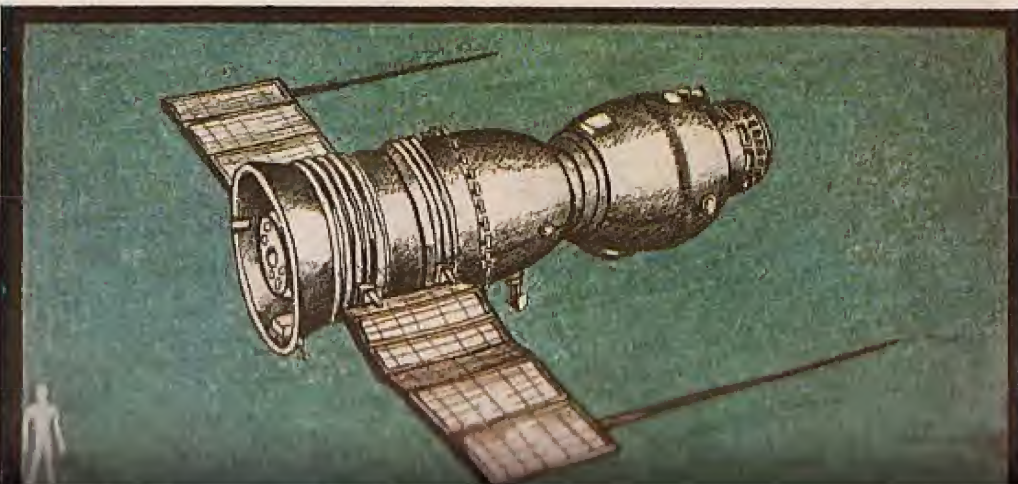
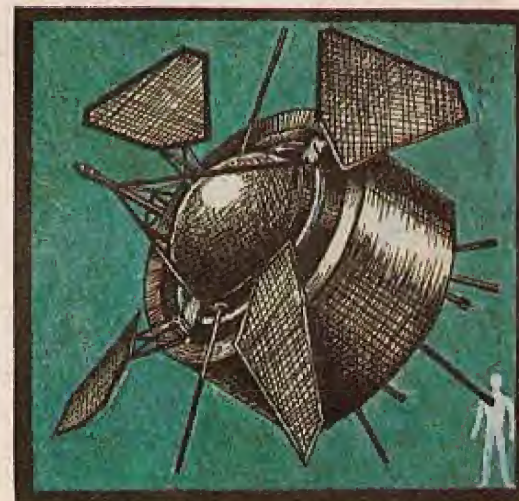
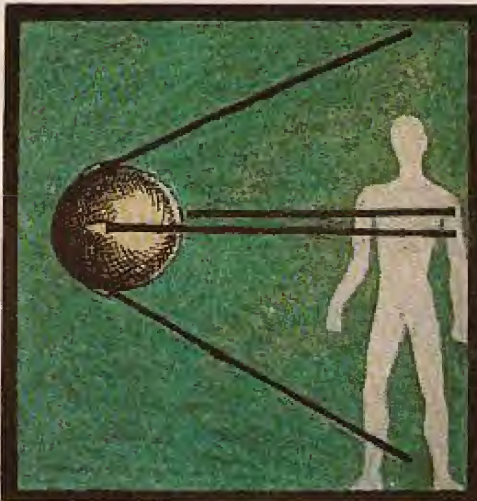
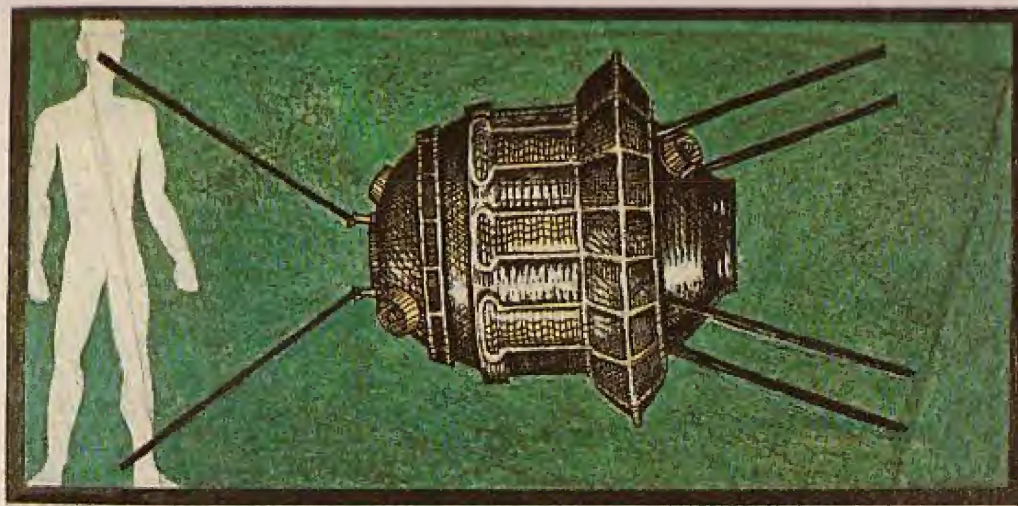


Man-made satellites and space rockets are sent up so we can learn more about outer space. Some satellites were sent up so that their paths would look like a circle around the Earth. The instruments on such satellites tell us about the upper layers of the atmosphere.

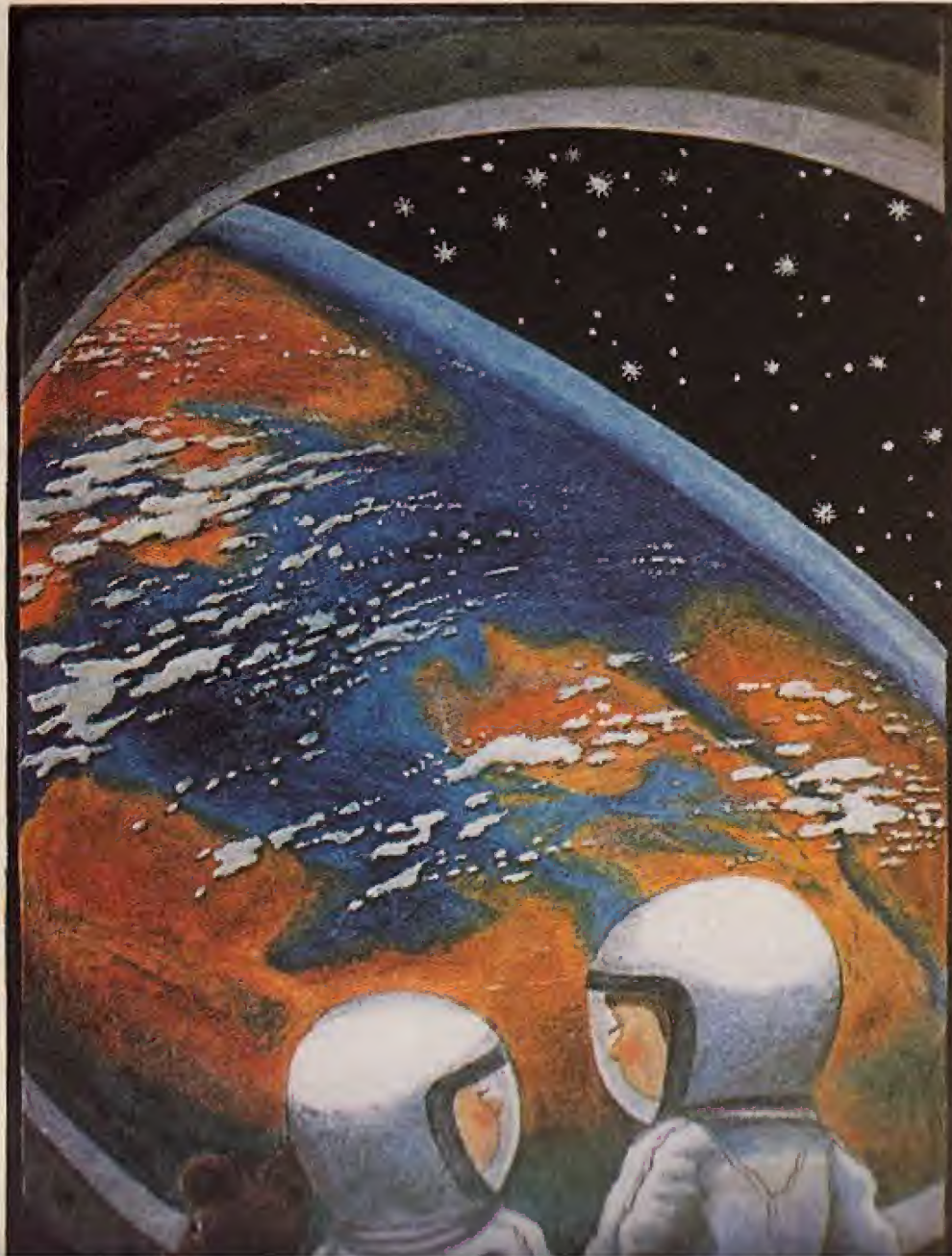
Other satellites have very long, oval-shaped paths. They travel far from the Earth and again come close. These satellites study outer space. There is no air there. Space rockets and interplanetary stations fly even further. Scientists guide them by radio waves.

Some interplanetary stations travel close to the Moon or Venus or Mars, or land on their surfaces. Then they can study the Moon and planets with the help of automatic instruments.

The results of these observations are transmitted by radio and television back to Earth.



What Does the Earth and Sky Look to Astronauts?



In 1961 the Soviet cosmonaut Yuri Gagarin was the first man to fly into space and travel around the Earth in the *Vostok* spaceship. He was also the first to see what the Earth and sky looked like from space. Flying on ships named *Vostok*, *Voskhod*, *Soyuz*, *Salyut*, *Gemini* and *Apollo*, Soviet cosmonauts and American astronauts have since observed the Earth from distances of several hundreds and even several thousands of kilometers. On the Earth, as on a globe, greenish-brown land and blue bodies of water can be seen. Much of the Earth's surface is covered with clouds.

And the sky around it is black even in the daytime and it is full of stars.

REQUEST TO READERS

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Please send your comments to 17, Zubovsky Boulevard, Moscow, USSR.